

SIP

Fabício Tamusiunas

Comitê Gestor Internet BR



SIP

RFC 3261 (antiga RFC 2543)

Protocolo de controle que trabalha na camada de aplicação

Permite que EndPoints encontrem outros EndPoints

Gerencia sessões multimídia entre os EndPoints

SIP

Trabalha tanto com UDP quanto TCP

Arquitetura horizontal

Cria infra-estrutura de rede (hosts) para acesso a End Points (chamados servidores Proxy)

SIP

Trabalha em conjunto com outros protocolos da IETF

- RTP (Real Time Protocol – RFC 1889)
- RTSP (Real Time Streaming Protocol – RFC 2326)
- MEGACO (Media Gateway Control Protocol – RFC 3015)
- SDP (Session Description Protocol – RFC 2327)

SIP – pontos de estabelecimento e término de conexão

User location: Determina o sistema final a ser usado na comunicação (outra ponta)

User availability: Determina disponibilidade do sistema final

User capabilities: Determina a Media a ser usada e seus parâmetros

Session setup: Chamada, estabelecimento de sessão e parâmetros em ambos os lados

Session management: transferência e término de sessões, modificação de parâmetros de sessões e serviços chamados.

SIP – Elementos de Rede

User Agents (UA)

Proxy Servers

Registrar

Stateless Servers

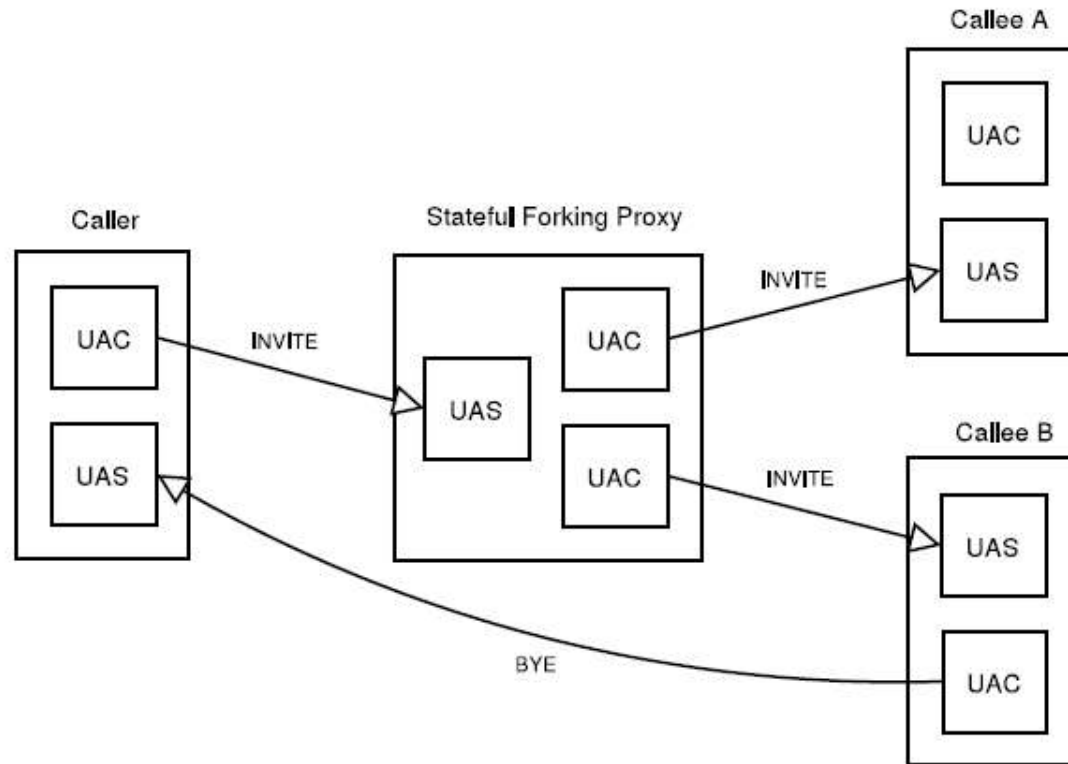
Statefull Servers

SIP – User Agents

End Points que usam SIP para encontrar outros agentes

Compostos de User Agent Servers (UAS) e User Agent Client (UAC) que são entidades lógicas apenas

SIP – UAC e UAS

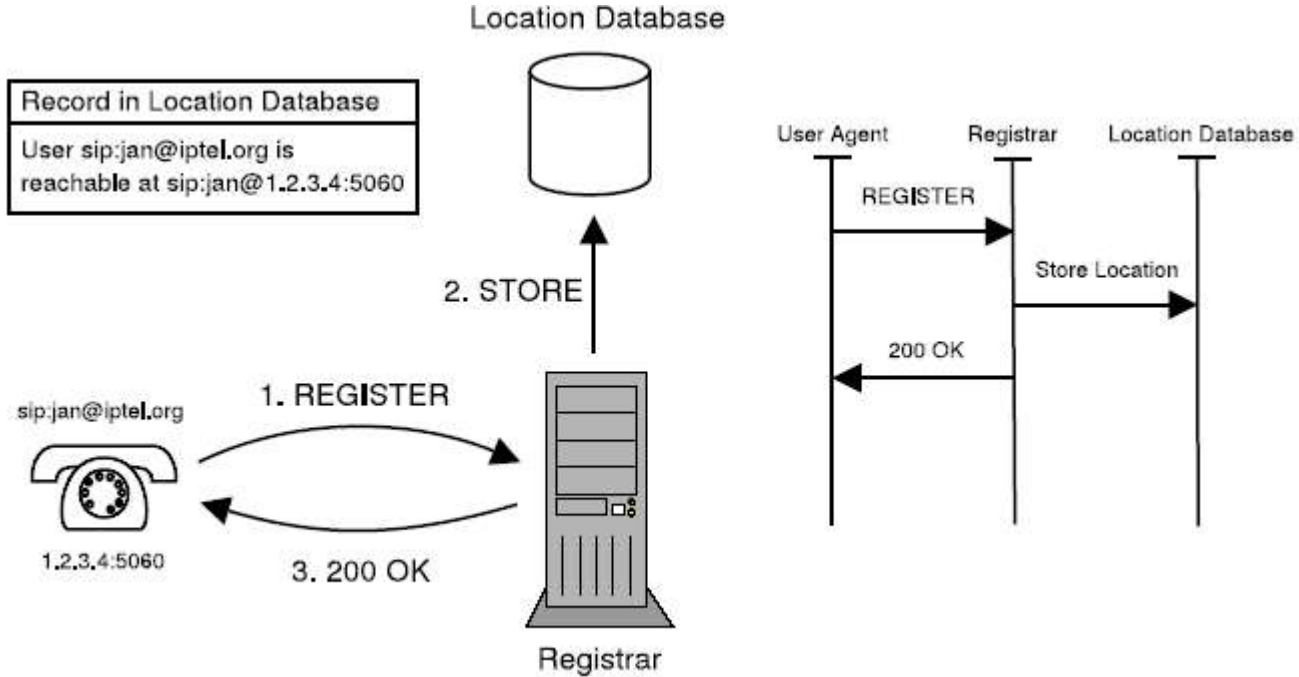


SIP - Registrar

É onde o proxy procura as informações sobre o End Point

Cada End Point é registrado no Registrar pelo Proxy (ex. Windows Messenger) ou diretamente por sí próprio (ex. CGUSip)

SIP - Registrar



SIP - Registrar

Packet 1: MADRIGAL.cg.org.br -> inoc-dba.pch.net

SIP (REGISTER)

Request Line: REGISTER sip:inoc-dba.pch.net SIP/2.0

Method Token: REGISTER

Request URI: sip:inoc-dba.pch.net

SIP Version: SIP/2.0

Header Section

Via: SIP/2.0/UDP

200.160.4.130:5060;rport;branch=z9hG4bKD10BCCF9F7124AA3AC94521E
18C6244F

From: Fabricio 2 <sip:22548*905@inoc-dba.pch.net>;tag=4200881920

To: Fabricio 2 <sip:22548*905@inoc-dba.pch.net>

Contact: "Fabricio 2" <sip:22548*905@200.160.4.130:5060>

Call-Id: CDF590C53134ECA85BEF15930EF6F60@inoc-dba.pch.net

Cseq: 59510 REGISTER

Expires: 0

Max-Forwards: 70

User-Agent: X-Lite release 1103a

SIP - Registrar

Packet 2: inoc-dba.pch.net -> MADRIGAL.cg.org.br

SIP (SIP/2.0)

Status Line: SIP/2.0 200 OK

Version: SIP/2.0

Status Code: 200

Reason-Phrase: OK

Header Section

Via: SIP/2.0/UDP

200.160.4.130:5060;rport=5060;branch=z9hG4bKD10BCCF9F7124AA3AC9
4521E18C6244F

From: Fabricio 2 <sip:22548*905@inoc-dba.pch.net>;tag=4200881920

To: Fabricio 2 <sip:22548*905@inoc-
dba.pch.net>;tag=b27e1a1d33761e85846fc98f5f3a7e58.e819

Call-Id: CDFF590C53134ECA85BEF15930EF6F60@inoc-dba.pch.net

Cseq: 59510 REGISTER

Server: Sip EXpress router (0.8.11rc7 (sparc64/solaris))

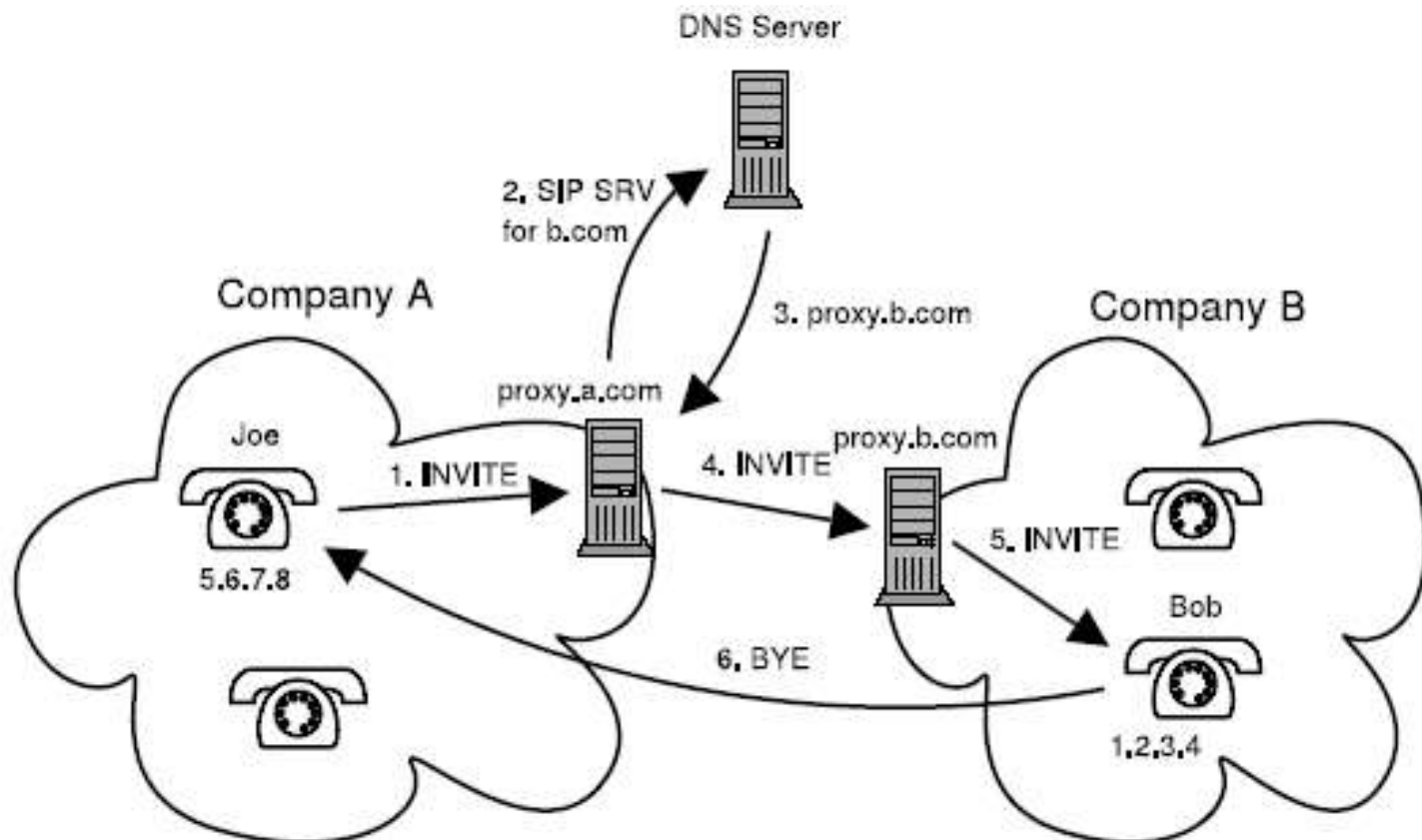
SIP – Proxy Servers

Responsáveis pelas conexões entre os End Points

Podem ser

- Stateful – Mantém o status das conexões, servindo de intermediário entre as conexões todo tempo (até o BYE)
- Stateless – Negocia a conexão, mas os streamings são enviados diretamente entre os End Points

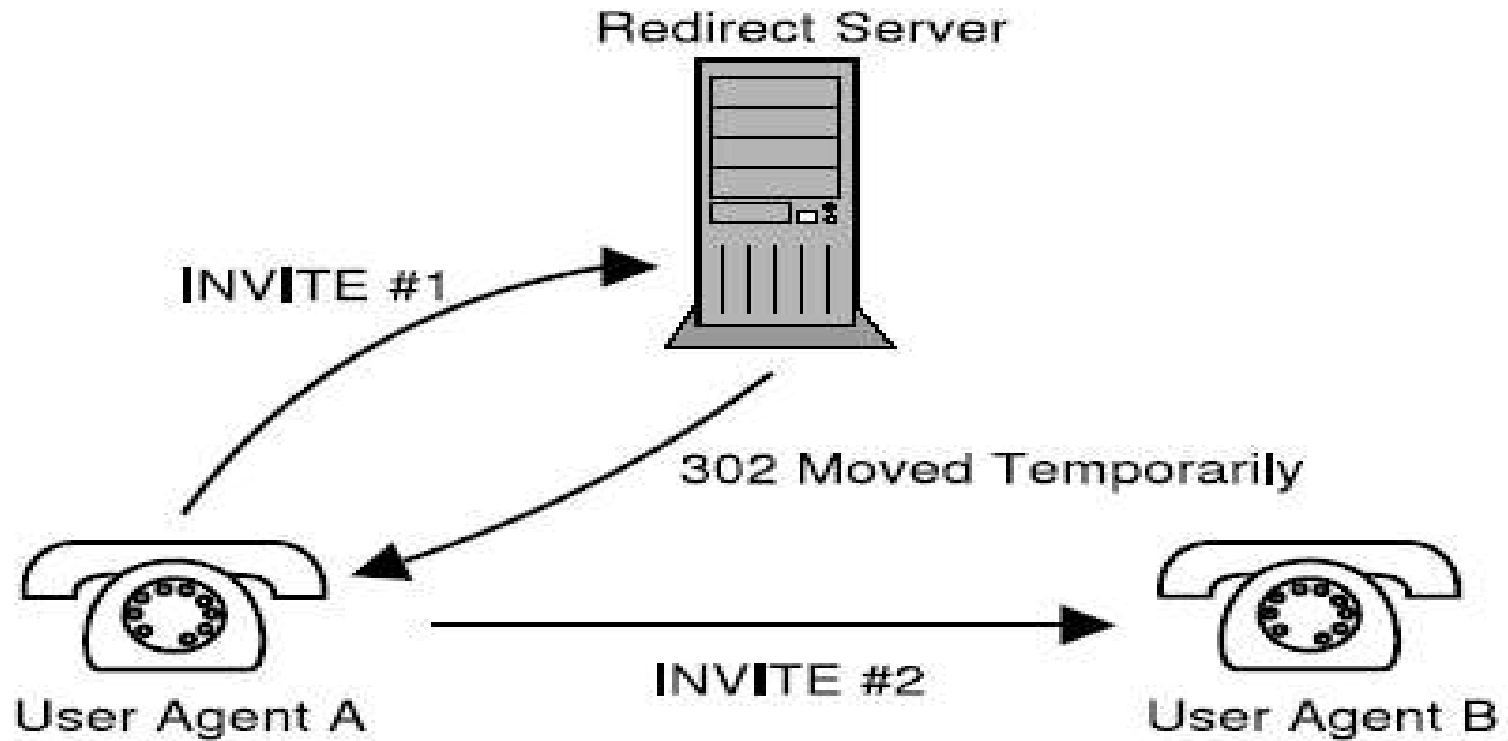
SIP – Session Invitation



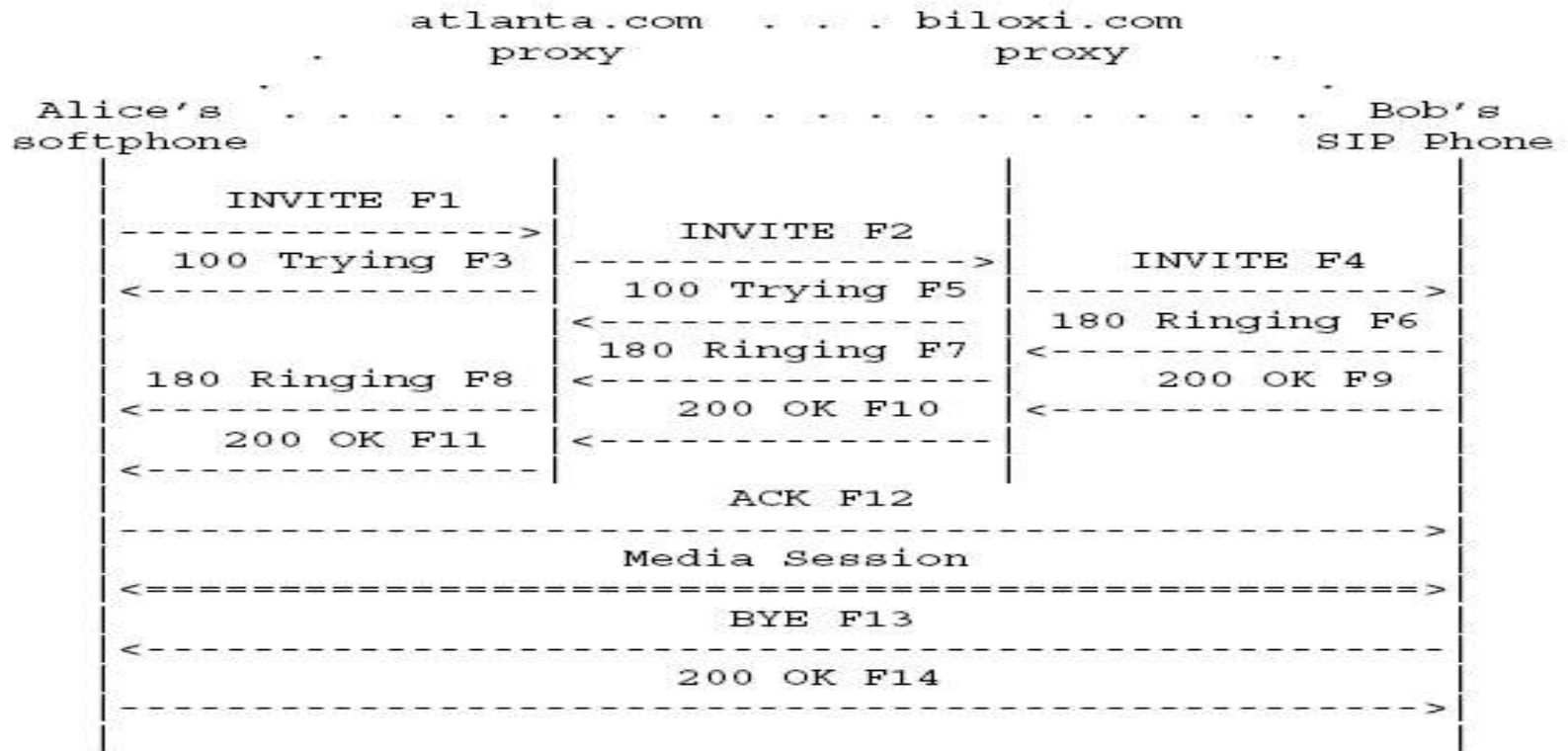
SIP – Redirect Server

Recebe requisição, pesquisa no Registrar e envia como resposta uma lista de localizações do usuário

SIP - Redireccionamiento



SIP - Exemplo de Conexão



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 5: 96.meeting.registro.br -> inoc-dba.pch.net
SIP (INVITE)

Request Line: INVITE sip:22548*905@204.61.208.90 SIP/2.0

Method Token: INVITE

Request URI: sip:22548*905@204.61.208.90

SIP Version: SIP/2.0

Header Section

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>

Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.96

Date: Fri, 16 Apr 2004 13:34:24 GMT

Cseq: 101 INVITE

User-Agent: CSCO/6

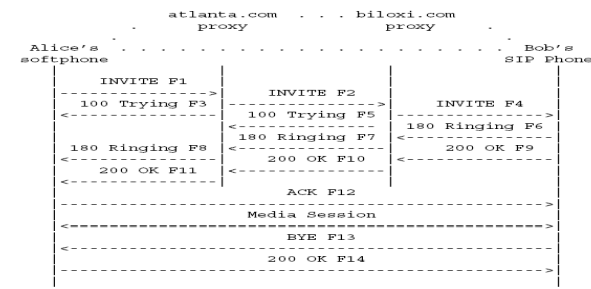
Contact: <sip:22548*900@200.160.0.96:5060>

Expires: 180

Content-Type: application/sdp

Content-Length: 246

Accept: application/sdp



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 6: inoc-dba.pch.net -> MADRIGAL.cg.org.br
SIP (INVITE)

Request Line: INVITE sip:22548*905@200.160.0.70:5060 SIP/2.0

Method Token: INVITE

Request URI: sip:22548*905@200.160.0.70:5060

SIP Version: SIP/2.0

Header Section

Max-Forwards: 10

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

Via: SIP/2.0/UDP 204.61.208.90;branch=z9hG4bKe732.4dc7.0

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>

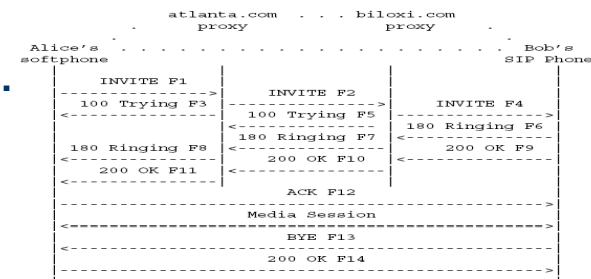
Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Date: Fri, 16 Apr 2004 13:34:24 GMT

Cseq: 101 INVITE

User-Agent: CSCO/6

Contact: <sip:22548*900@200.160.0.96:5060>



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 7: inoc-dba.pch.net -> 96.meeting.registro.br
SIP (SIP/2.0)

Status Line: SIP/2.0 100 trying -- your call is important to us

Version: SIP/2.0

Status Code: 100

Reason-Phrase: trying -- your call is important to us

Header Section

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

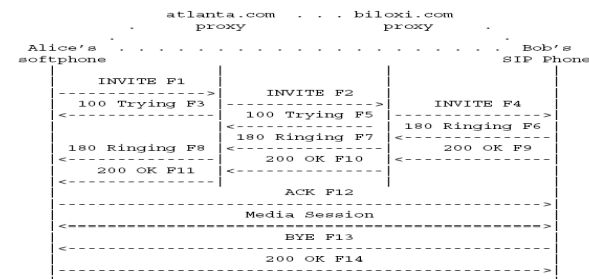
To: <sip:22548*905@204.61.208.90>

Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.96

Cseq: 101 INVITE

Server: Sip EXpress router (0.8.11rc7 (sparc64/solaris))

Content-Length: 0



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 8: MADRIGAL.cg.org.br -> inoc-dba.pch.net
SIP (SIP/2.0)

Status Line: SIP/2.0 100 Trying

Version: SIP/2.0

Status Code: 100

Reason-Phrase: Trying

Header Section

Via: SIP/2.0/UDP 204.61.208.90;branch=z9hG4bKe732.4dc7.0

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>;tag=315748910

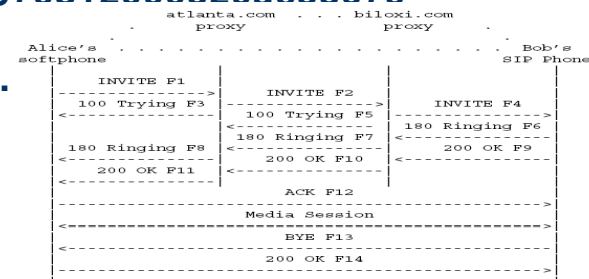
Contact: <sip:22548*905@200.160.0.70:5060>

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Cseq: 101 INVITE

Server: X-Lite release 1103a



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 9: MADRIGAL.cg.org.br -> inoc-dba.pch.net
SIP (SIP/2.0)

Status Line: SIP/2.0 180 Ringing

Version: SIP/2.0

Status Code: 180

Reason-Phrase: Ringing

Header Section

Via: SIP/2.0/UDP 204.61.208.90;branch=z9hG4bKe732.4dc7.0

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>;tag=315748910

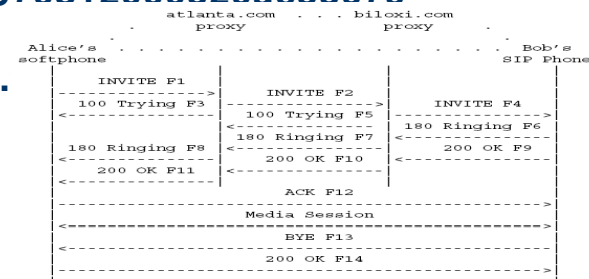
Contact: <sip:22548*905@200.160.0.70:5060>

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Cseq: 101 INVITE

Server: X-Lite release 1103a



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 10: inoc-dba.pch.net -> MADRIGAL.cg.org.br
SIP (INVITE)

Request Line: INVITE sip:22548*905@200.160.0.70:5060 SIP/2.0

Method Token: INVITE

Request URI: sip:22548*905@200.160.0.70:5060

SIP Version: SIP/2.0

Header Section

Max-Forwards: 10

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

Via: SIP/2.0/UDP 204.61.208.90;branch=z9hG4bKe732.4dc7.0

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>

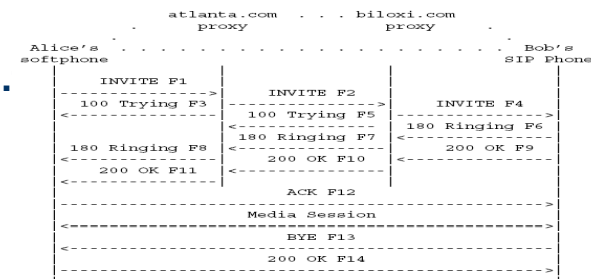
Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Date: Fri, 16 Apr 2004 13:34:24 GMT

Cseq: 101 INVITE

User-Agent: CSCO/6

Contact: <sip:22548*900@200.160.0.96:5060>



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 11: inoc-dba.pch.net -> 96.meeting.registro.br
SIP (SIP/2.0)

Status Line: SIP/2.0 180 Ringing

Version: SIP/2.0

Status Code: 180

Reason-Phrase: Ringing

Header Section

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>;tag=315748910

Contact: <sip:22548*905@200.160.0.70:5060>

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

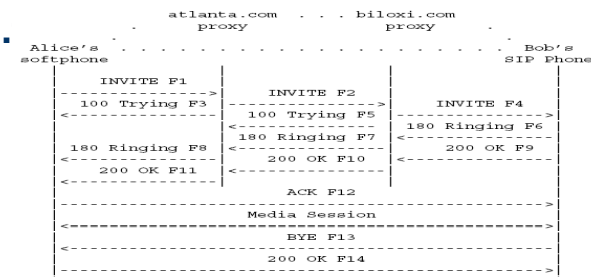
Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Cseq: 101 INVITE

Server: X-Lite release 1103a

Content-Length: 0

Marker: End of Header Section



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 13: MADRIGAL.cg.org.br -> inoc-dba.pch.net
SIP (SIP/2.0)

Status Line: SIP/2.0 200 Ok

Version: SIP/2.0

Status Code: 200

Reason-Phrase: Ok

Header Section

Via: SIP/2.0/UDP 204.61.208.90;branch=z9hG4bKe732.4dc7.0

Via: SIP/2.0/UDP 200.160.0.96:5060

From: "Fabricio Tamusiunas"

<sip:22548*900@204.61.208.90>;tag=000d6570812000320ac53679-09d26f44

To: <sip:22548*905@204.61.208.90>;tag=315748910

Contact: <sip:22548*905@200.160.0.70:5060>

Record-Route: <sip:22548*905@204.61.208.90;ftag=000d6570812000320ac53679-09d26f44;lr=on>

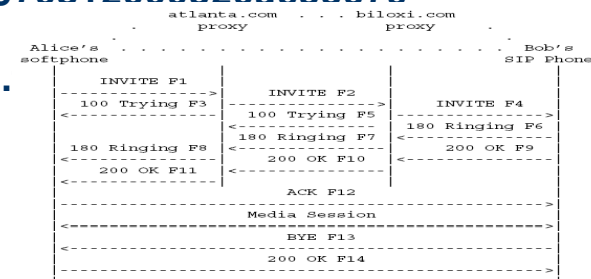
Call-Id: 000d6570-812000cc-0876f1f4-601c2189@200.160.0.

Cseq: 101 INVITE

Content-Type: application/sdp

Server: X-Lite release 1103a

Content-Length: 296



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 16: MADRIGAL.cg.org.br -> 96.meeting.registro.br

RTCP, Length = 84 bytes

Sender Report: Length = 12 (32 bit words)

Packet Type: Sender Report (200), Version: 2, Padding: 0, Count: 1

SSRC: 3970928509

NTP Timestamp: 2284140.61

RTP Timestamp: 0

Packet Count: 0

Octet Count: 0

Report Block[1]

SSRC: 3970928509

Fraction Lost: 0%, Cumulative Packets Lost: 0

Sequence Number Cycles: 0, Highest Sequence Received: 0

Interarrival Jitter: 0

Last SR: 24425.61 sec

Delay Since Last SR: 0.0 sec (1)

Receiver Report: Length = 7 (32 bit words)

Packet Type: Receiver Report (201), Version: 2, Padding: 0, Count: 1

SSRC: 3970928509

Report Block[1]

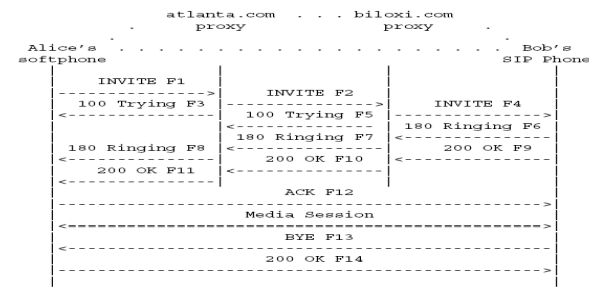
SSRC: 0

Fraction Lost: 0%, Cumulative Packets Lost: 0

Sequence Number Cycles: 0, Highest Sequence Received: 0

Interarrival Jitter: 0

Last SR: 24425.61 sec



SIP – Exemplo de conexão

96.meeting.registro.br (22548*900) ->
MADRIGAL.cg.org.br (22548*905)

Packet 17: MADRIGAL.cg.org.br -> 96.meeting.registro.br

RTP Section: Length = 172 bytes

RTP Status: V=2, X=0, CC=0

10.....: (V) Version = 2

..0.....:(P) Padding

...0.....: (X) Extension [0] = No Header Extension Follows

....0000: (CC) Number of CSRC Identifiers = 0

Payload: Marker=1, Type: PCMU(G.711) (0), Audio/Video: Audio Clock Rate (Hz): 8000

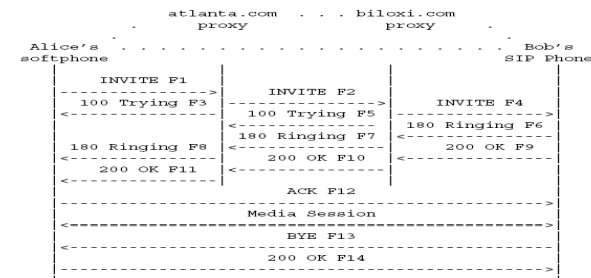
1.....: (M) Marker = 1

.0000000: (PT) Payload Type [0] = PCMU(G.711)

Sequence Number: 1

Timestamp: 160

Synchronization Source ID: SSRC = 0xECAF8F7D



SIP + FIREWALL

Todo o tráfego é UDP

Portas de entrada

- 5060
- Faixa negociada para entrada de tráfego RTP

SIP + NAT

SIP pode trabalhar com NAT

Deve-se redirecionar a porta 5060 do gateway NAT para o terminal SIP

Direciona-se uma faixa pre-estabelecida para o servidor